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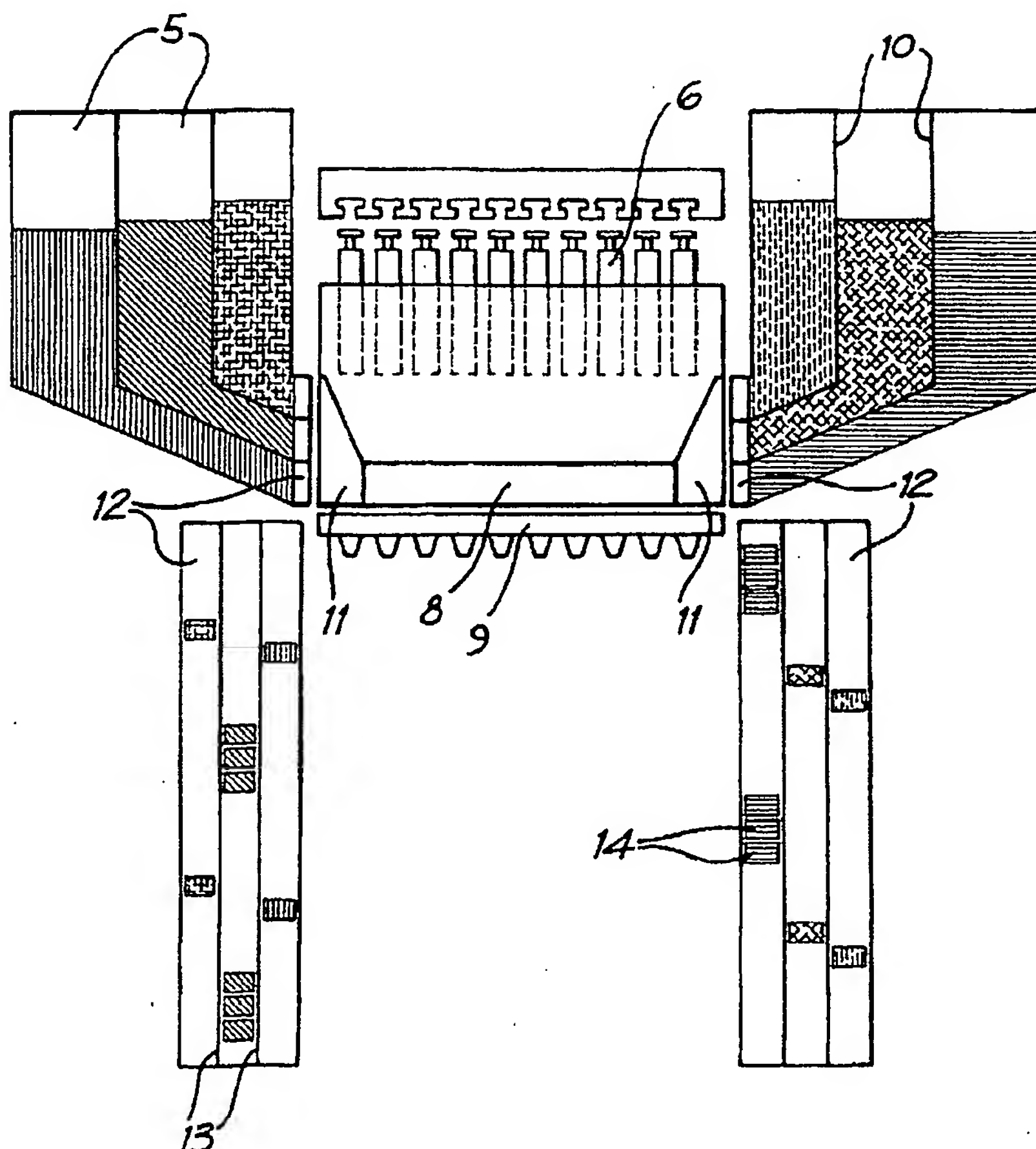
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[Continued on next page]

(54) Title: IMPROVEMENTS IN FOOD DEPOSITION APPARATUS



(57) Abstract: Disclosed is apparatus for the storage and deposition of a plurality of liquid food components to a mould, said apparatus including: a deposition mechanism for intermittently depositing predetermined quantities of said plurality of liquid food components to said mould, said mechanism having a plurality of individual deposition points; a plurality of liquid food storage vessels, each having an outlet adapted to supply an individual liquid food component to said deposition mechanism; and a plurality of arrayed liquid food supply galleries extending from said liquid food storage vessels to said deposition mechanism, thereby to facilitate flow of said food components to said deposition points; wherein said plurality of liquid food storage vessels are each equipped with an elongate outlet, said outlet being adapted to allow said liquid food to flow substantially directly into each supply gallery along that inlet region; and wherein there is provided a means for selectively allowing or preventing flow of the contents of each or any of said vessels to each or any of said galleries.

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Published:

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4/pets 1
JG20 Rec'd PCT/PTO 1 4 JUL 2005**IMPROVEMENTS IN FOOD DEPOSITION APPARATUS**

Field of the Invention

5 The invention relates to the field of commercial food manufacture. In particular, the invention relates to improved apparatus for depositing multiple liquid food components in to a mould.

Background of the Invention

10 Increasing consumer sophistication has led to a desire for food manufacturers to provide food products of more striking appearance. A common method of improving the visual appeal of food products, especially in the field of confectionery manufacture, is to provide multi-component food products, for example multi-coloured confectionery pieces. In the following discussion, the term 'multicoloured confectionery' will be understood by persons skilled in the art to encompass confectionery that is made up of individual pieces of a single colour, 15 such as 'jelly beans', and confectionery pieces that contain multiple colours within the same piece, such as the well-known multicoloured 'snake' candy.

Existing techniques for providing multicoloured confectionery pieces will now be discussed, however those skilled in the art will appreciate that the techniques discussed herein may equally be applied to other food product fields.

20 A typical production line for the production of multicoloured sugar-based confectionery pieces involves deposition of the confectionery material as syrup into starch moulds. Typically, the syrup is drawn from one or more supply hoppers into a deposition apparatus that includes syrup supply galleries extending from the hopper(s), a reciprocating positive displacement pump and valve system and a set of deposition nozzles bored through a nozzle plate. The 25 positive displacement pump and valve system typically employs a multi-piston and cylinder device, but may equally be a rotary pump type.

The syrup is typically drawn into the supply galleries, which extend laterally across the deposition apparatus, by the pistons operating in a priming stroke. 30 Then the syrup is forced by the pistons, in a discharge stroke, out of the supply galleries and downward through one or more of the nozzles in the nozzle plate, thereby depositing the syrup into a predetermined pre-formed mould cavity in the starch mould.

A number of individual dispensing vessels (ie hoppers) are typically positioned alongside and adjacent the inlet side of the deposition apparatus, and are typically configured to provide a single colour to a set group of galleries along each side of the depositor. Where multicoloured deposition is to be performed, a single, multi-compartment hopper vessel may also be used, each compartment then containing different coloured syrups. The multi-compartment hopper includes a storage vessel which extends along the inlet side of the deposition apparatus, and is divided at set intervals along its length by dividing walls that separate the different coloured syrups from one another. Each of the coloured syrups flow from the individual hopper compartments to the group of galleries immediately adjacent the division of the hopper containing that coloured syrup. Therefore, confectionery pieces of a given colour may only be deposited in the zone of the starch mould that is immediately adjacent the hopper compartment (or individual hopper vessel, if employed) that contains syrup of that colour.

The above described system works well for multicoloured products such as jelly beans, where many different coloured pieces are produced, but where individual pieces contain a single colour. However, if it is desired to manufacture pieces of confectionery, where each piece contains more than one colour, such equipment is not suitable as it is not capable of delivering individual colours to different zones throughout the starch mould.

A technique that is well known in the prior art for overcoming this drawback is the insertion of a distribution plate in between the supply galleries and the deposition nozzles. The distribution plate is typically a metal plate that has an intricate pattern of channels milled through it that are designed to direct flow of a particular coloured syrup from the zone in which it is available to the zone where it is required to be deposited.

However, a major drawback of this type of system is that for every different type or shape of product to be made there is required a different distribution plate. Each distribution plate tends to be bulky, intricate in design and difficult to manufacture. These plates are accordingly very expensive in terms of design, manufacturing and storage costs. They also tend to be very heavy and difficult to install and remove, increasing production downtime and presenting a health and

safety risk to those operators whose job it is to change them between runs of different products.

In addition, the lengthy flow paths that are required in the distribution plate tend to produce variability in the deposit volume and therefore in the mass of individual pieces. This may cause an aesthetic problem with the confectionery pieces, as well as obliging the manufacturer to increase their product giveaway to account for the potential shortfall in product mass.

Summary of the Invention

Therefore, it is an object of the present invention to provide an improved deposition apparatus that alleviates the problems of the prior art.

In one aspect of the invention, there is provided an apparatus for the storage and deposition of a plurality of liquid food components to a mould, said apparatus including:

- a deposition mechanism for intermittently depositing predetermined quantities of said plurality of liquid food components to said mould, said mechanism having a plurality of individual deposition points;

- a plurality of liquid food storage vessels, each having an outlet adapted to supply an individual liquid food component to said deposition mechanism; and

- a plurality of arrayed liquid food supply galleries extending from said liquid food storage vessels to said deposition mechanism, thereby to facilitate flow of said food components to said deposition points;

- wherein said plurality of liquid food storage vessels are each equipped with an elongate outlet, said outlet being adapted to allow said liquid food to flow substantially directly into each supply gallery along that inlet region; and

- wherein there is provided a means for selectively allowing or preventing flow of the contents of each or any of said vessels to each or any of said galleries.

This configuration allows greater flexibility in the design of varied and irregular deposition patterns than has been possible with prior art equipment, because the invention makes each of the different components accessible to each of the galleries in the deposition apparatus as desired, thereby rendering it a simple matter of opening or closing an access point for any chosen component to be directed to any chosen gallery. A further advantage of this arrangement is that, unlike in the prior art, each component has a relatively short flow path to any

position in the deposition apparatus. This has advantages in that variability in deposit volume is significantly reduced, thereby reducing the amount of necessary giveaway in each product.

Advantageously, a program plate with apertures positioned adjacent the
5 chosen component hopper for each desired gallery provides the means by which flow of the desired component is selectively directed to the chosen gallery. It will be appreciated by those skilled in the art that changing the flow pattern of components to individual deposition points may be achieved by simply changing the configuration of the program plate, without need to modify the internal
10 geometry of the deposition mechanism itself, for example by installing a distribution plate.

This provides a significant simplification to existing technologies, whereby separate deposition mechanisms must be provided for each different deposition pattern, and where some of these patterns may be extremely complex and costly
15 to manufacture, in the order of AUD 10,000 per pattern. In contrast, the invention provides a way of altering the deposition pattern by simply replacing a relatively simple and inexpensive change-part, namely the program plate.

The longitudinally oriented storage vessel outlets allow this design to be contemplated, as they allow the different components to be available to all
20 galleries of the deposition apparatus, not merely a select few, as in the prior art. Program plates typically cost less than AUD 1,000 to manufacture, and take much less time to change over between runs.

Preferably, the apparatus is configured such that the space between the vessel outlets and the galleries is adapted to receive program plates that are
25 configured to simply slide into and out of operational position, thereby reducing the complexity and time taken to change the moulding equipment between runs of different products.

Most preferably, the invention is characterised by a plurality of broad, nested hoppers, each having an elongate slot serving as an outlet, said slots
30 being located one on top of the other and running the length of the deposition apparatus; and wherein the program plates are solid plates whose height is substantially equal to the combined height of said slots and which feature apertures aligned vertically with each individual slot and aligned longitudinally

with the individual galleries into which it is desired that the liquid food from said slot will flow.

In another aspect, the invention provides multicoloured confectionery when deposited by the above described apparatus.

5 In yet another aspect of the invention there is provided a method of making multicoloured confectionery, including the step of depositing via deposition apparatus as described above.

Now will be described, by way of a specific non-limiting example, a preferred embodiment of the invention.

10 Brief Description of the Drawings

Figure 1 shows a schematic plan view of a confectionery depositor according to the prior art.

Figure 2 shows a schematic plan view of a confectionery depositor according to the invention.

15 Figure 3 shows a sectional elevation view of a confectionery depositor according to the invention.

Figure 4 shows an example of multicoloured 'snake' confectionery design, as deposited in a starch mould, which may be provided by the invention; and the program plates that may be used to achieve this design.

20 Figure 5 shows another example of multicoloured 'snake' confectionery design, as deposited in a starch mould, which may be provided by the invention; and the program plates that may be used to achieve this design.

Detailed description of a preferred embodiment

Referring first to figure 1, there is shown a schematic plan view of a multi-
25 coloured confectionery depositor 1, of the type well known in the art, and a schematic view 2 of the confectionery pieces 3 deposited in a starch mould by this type of depositor. The position of the depositor galleries 6 are also shown.

Numerous companies manufacture such depositors, including NID of Australia, and Winkler & Dunnebier of Germany. Such depositors are defined by
30 one or more syrup hoppers which are positioned adjacent a deposition mechanism, usually a sliding or rotating valve type but other mechanisms may be used, which is positioned above a starch mould, as described above in discussion of the prior art.

The multi-component syrup hoppers 5, being divided into separate compartments for each of the different coloured syrups, are arranged along each side of the deposition mechanism 1. Represented particularly in figure 1 are the positions of the syrup flow galleries 6. It will be noted that only the galleries positioned immediately adjacent the hoppers of particular colours have access to the syrup of that colour. Therefore, if that colour is required to be deposited at another point in the starch tray 4, then a complex drilled nozzle plate of the type well-known in the art will be required to be positioned between the galleries and the deposit nozzles. The nozzle plate will need to have a channel cut into it that is capable of transporting the syrup of the desired colour from the gallery where it is available to the point where it is required. As discussed above, the need for such complicated nozzle plates presents numerous disadvantages.

Turning now to figure 2, there is shown a schematic plan view of a confectionery depositor according to the invention. In particular, the internal divisions of the syrup hoppers 5 will be noted: the dividing walls run longitudinally through the hoppers 5. As illustrated, the coloured syrups are therefore available to any of the galleries in the depositor, as the outlets of the hoppers are now effectively adjacent all of the galleries. This means that by simply opening or closing access of the syrup to a given gallery, each of the coloured syrups is readily available to any part of the deposit mechanism, as reflected in the schematic view of the multicoloured pieces deposited in the starch tray 4.

Figure 3 shows a cross-sectional view of the configuration of the hoppers 5 of a depositor according to the invention. The deposition mechanism is represented schematically by the pistons 8, galleries 6 and nozzle plate 9. It will be seen that the hoppers are divided from one another by plates 10 running longitudinally along the length of the depositor sides. The syrup in each of the hoppers 5 can then flow into a common access point 11 to each individual gallery. A program plate 12 can then be inserted in between the hoppers and the access point. The program plate 12 can be selectively drilled to allow the desired colour syrup into the access point, while blocking access to the other colour syrups. This has the effect of eliminating the distribution plate, or at least greatly simplifying the nature of any channelling required in the distribution plate.

As the program plates themselves, also illustrated in elevation view in figure 3, are relatively simple, and as they are positioned in a readily accessible point in the depositor assembly, it is therefore a relatively simple matter to remove and replace the specific program plates for each different product design. The program plate illustrated is divided into three longitudinal divisions 13, corresponding with the longitudinal positions of the outlets of the three hoppers, and numerous lateral sections 14, corresponding with the positions of each of the depositor galleries. In order to select which colour syrup flows into which gallery, it is simply necessary to provide a hole in the program plate at the position where the selected syrup hopper coincides with the selected gallery.

Potential program plate designs for corresponding multicoloured confectionery 'snake' designs 15 are illustrated in figures 4 and 5. In both of these diagrams, the open holes of the program plates are shaded in a manner corresponding with the syrup colour that is intended to flow through the plate at that point.

While the above example is primarily concerned with deposition of different coloured sugar syrups for sugar-based confectionery, the person skilled in the art will appreciate that the principles upon which the invention is based are applicable to the delivery of many other kinds of fluid food materials and to many other kinds of deposition apparatus:

The skilled person will also appreciate that the physical design and arrangement of many of the components of the apparatus depicted may be altered while still remaining within the scope of the invention. For example, the entirety of the hoppers themselves need not be elongated: the hoppers may be positioned individually along the side of the deposition apparatus, much as shown in figure 1, provided the hopper outlets themselves are elongate and extend along the array of gallery inlets. However, the longitudinal nature of the hoppers shown in figure 3 advantageously provides more even liquid flow across the breadth of the hopper outlet slots:

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Apparatus for the storage and deposition of a plurality of liquid food components to a mould, said apparatus including:

5 a deposition mechanism for intermittently depositing predetermined quantities of said plurality of liquid food components to said mould, said mechanism having a plurality of individual deposition points;

a plurality of liquid food storage vessels, each having an outlet adapted to supply an individual liquid food component to said deposition mechanism; and

10 a plurality of arrayed liquid food supply galleries extending from said liquid food storage vessels to said deposition mechanism, thereby to facilitate flow of said food components to said deposition points;

wherein said plurality of liquid food storage vessels are each equipped with an elongate outlet, said outlet being adapted to allow said liquid food to flow substantially directly into each supply gallery along that inlet region; and

15 wherein there is provided a means for selectively allowing or preventing flow of the contents of each or any of said vessels to each or any of said galleries.

2. The apparatus of claim 1, wherein the means by which flow of the liquid food from any one vessel is directed to the predetermined gallery or galleries is a program plate, said program plate having apertures selectively positioned such
20 that, when said plate is installed in an operational position between said vessel outlet and the inlet of said chosen galleries, said apertures provide an open conduit between both the given liquid food vessel outlet and the inlet of each predetermined gallery, thereby allowing only the given liquid food to enter said predetermined gallery or galleries.

25 3. The apparatus of claim 2, wherein a plurality of interchangeable customised program plates are provided for the direction of food component flow required for different individual product deposition schemes

4. The apparatus of any preceding claim, wherein the apparatus is configured such that a space between the outlets of said vessels and the inlets of said
30 galleries is adapted to receive program plates that are adapted to slide into said

operational position, thereby facilitating interchange of the depositing configuration of the moulding equipment between runs of different products.

- 5 5. The apparatus of any preceding claim, wherein said liquid food storage vessels are characterised by a plurality of broad, nested hoppers, each having an elongate slot serving as an outlet, said slots being effectively arranged one on top of the other and disposed adjacent the inlets of the arrayed galleries.
- 10 6. The apparatus of claim 5, wherein the program plates are solid plates whose height is substantially equal to the combined height of said slots and which feature apertures aligned vertically with each individual slot and aligned longitudinally with the individual galleries into which it is desired that the liquid food from said slot will flow.
- 15 7. The apparatus of any preceding claim, when used in the manufacture of multi-coloured confectionery.
- 15 8. The apparatus of any preceding claim, wherein said plurality of liquid food components are coloured confectionery syrups.
- 20 9. Apparatus for the storage and deposition of a plurality of liquid food components to a mould substantially as herein described with reference to the figures.
- 20 10. A multi-component food product, when manufactured via apparatus as defined in any preceding claim.
- 25 11. The multi-component food product of claim 10, wherein said food product is multi-coloured confectionery.
- 25 12. A method of manufacturing a multi-component food product, said method including the step of depositing one or more of said components via apparatus as defined in any one of claims 1 to 10.

13. The method of claim 12, wherein said multi-component food product is multi-coloured confectionery.

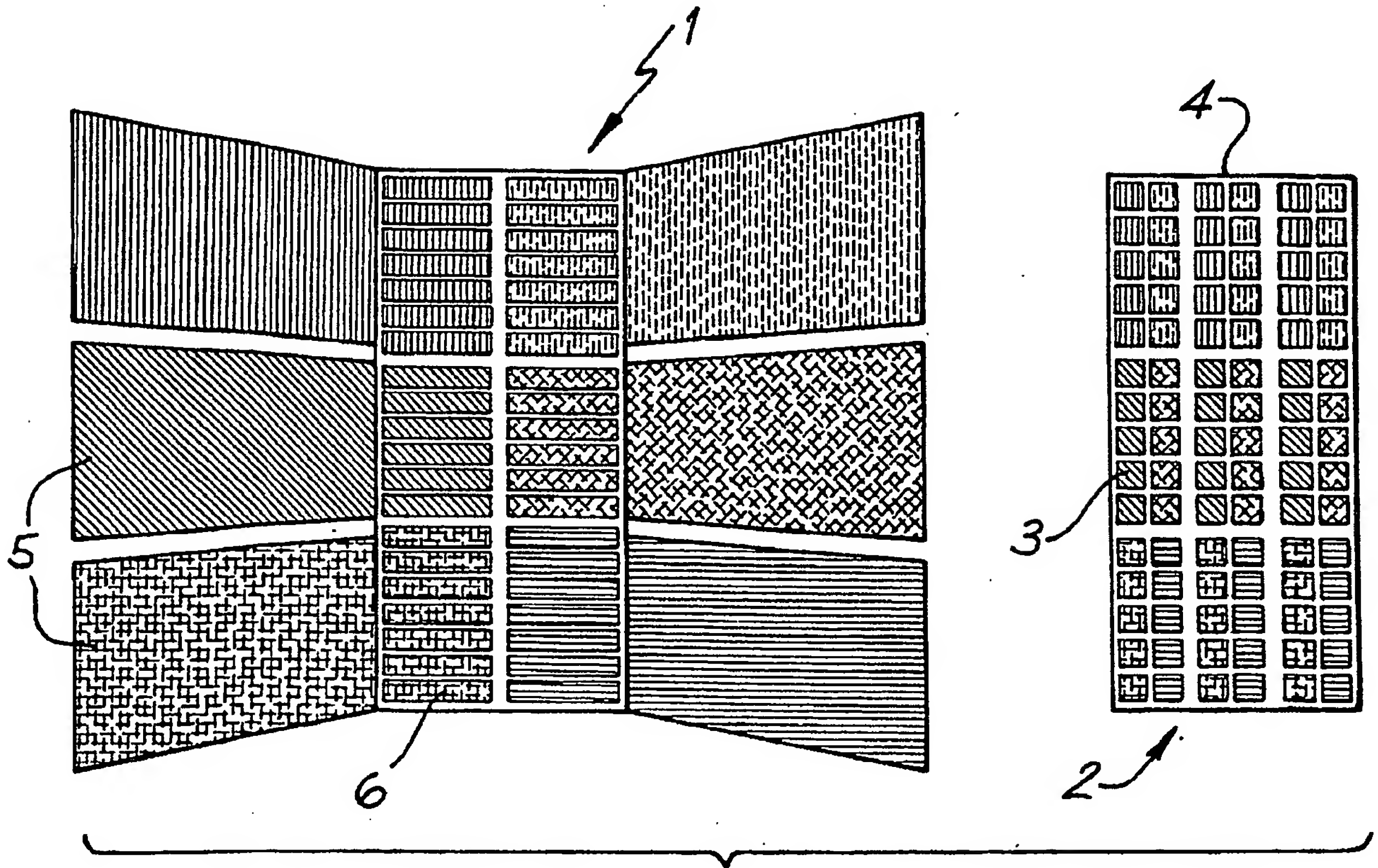


FIG. 1
PRIOR ART

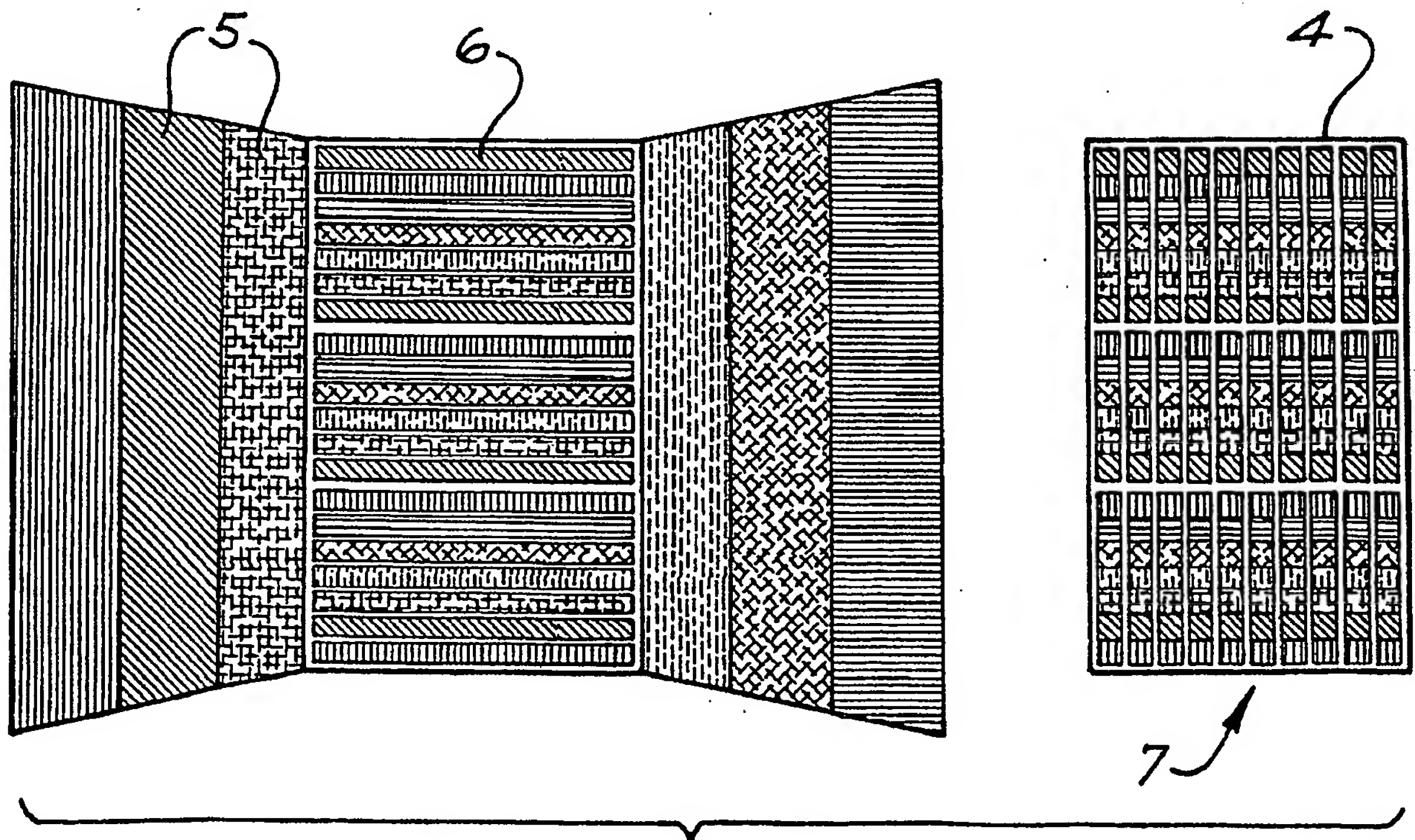


FIG. 2

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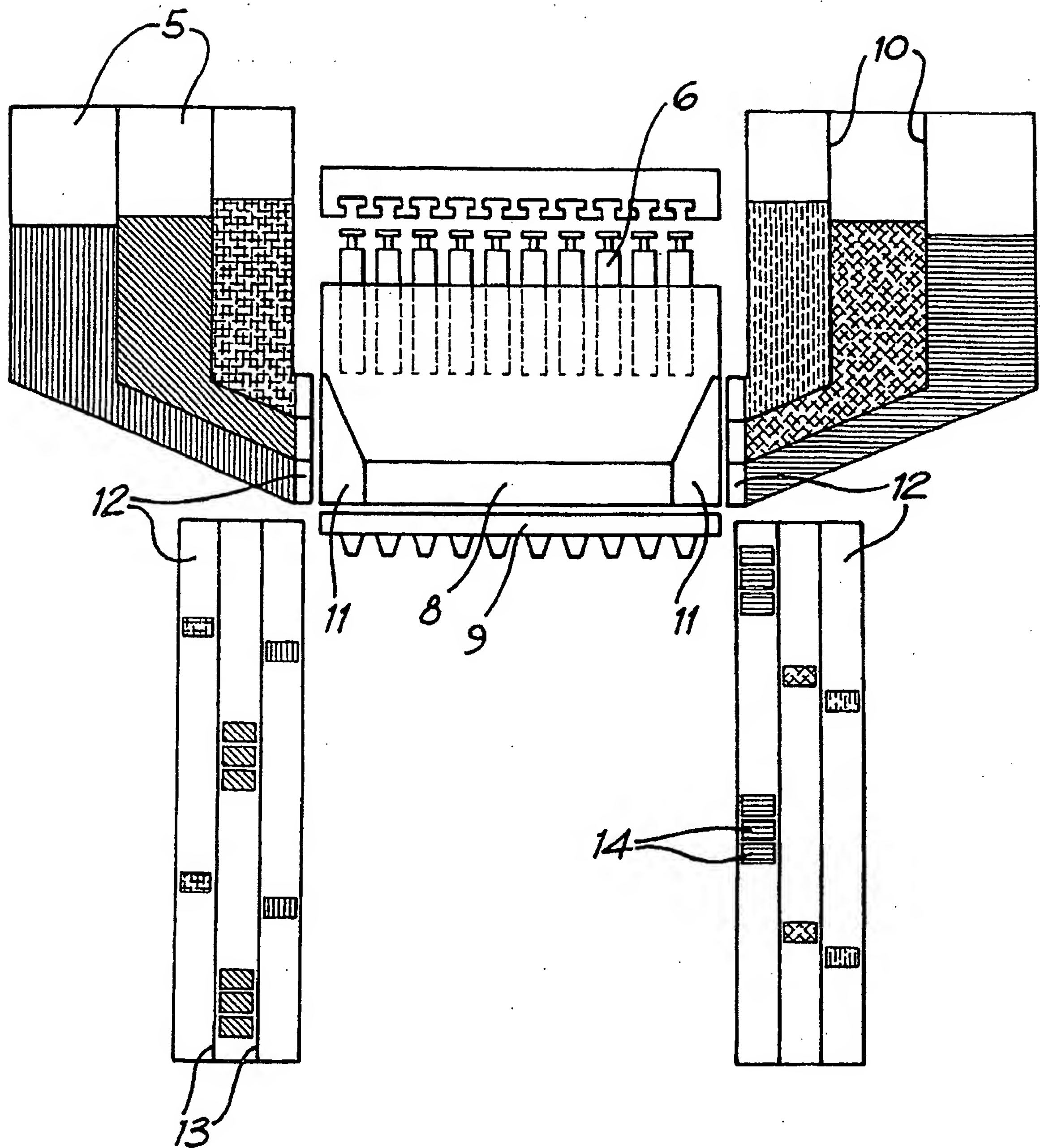


FIG. 3

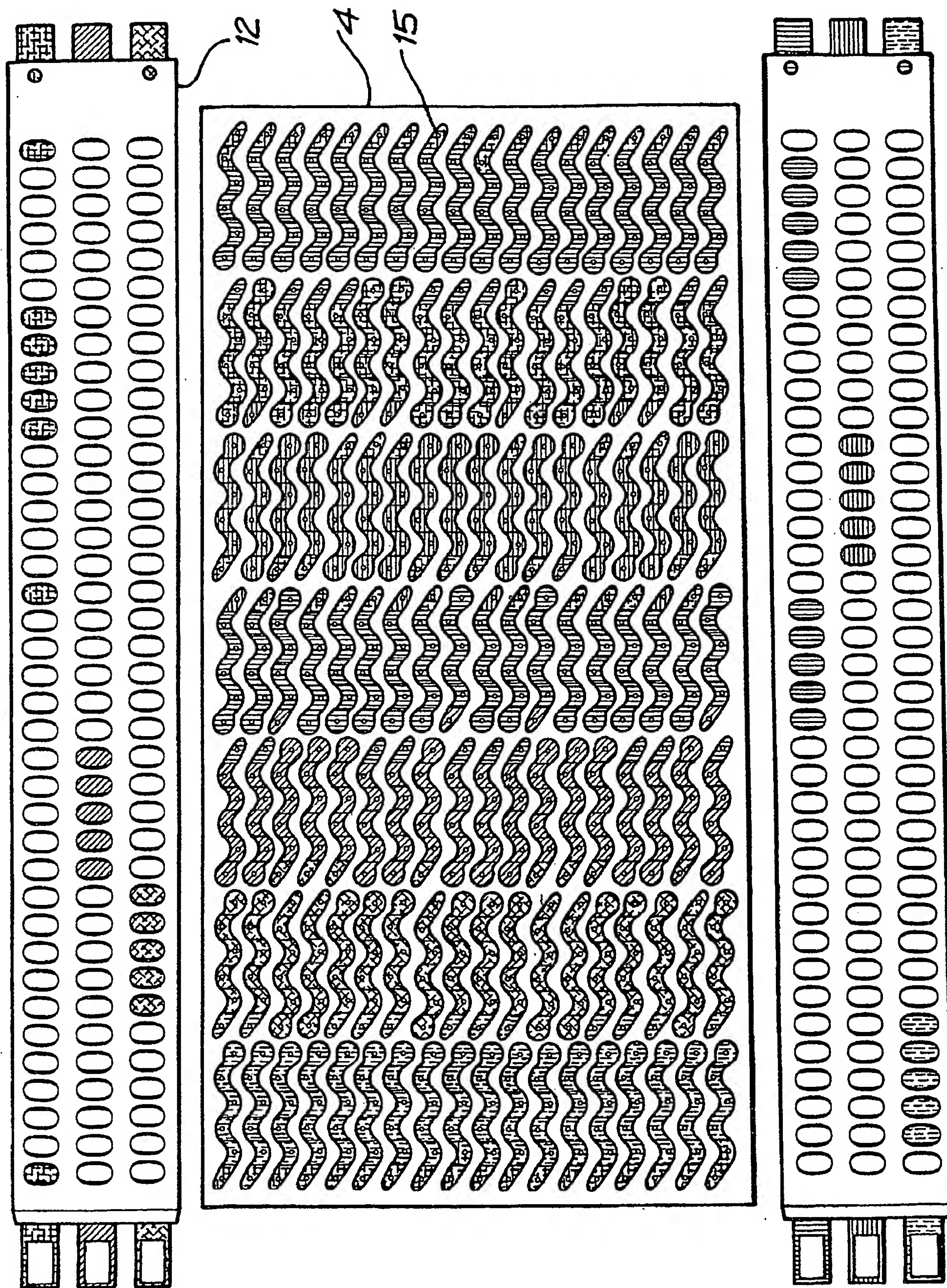


FIG. 4

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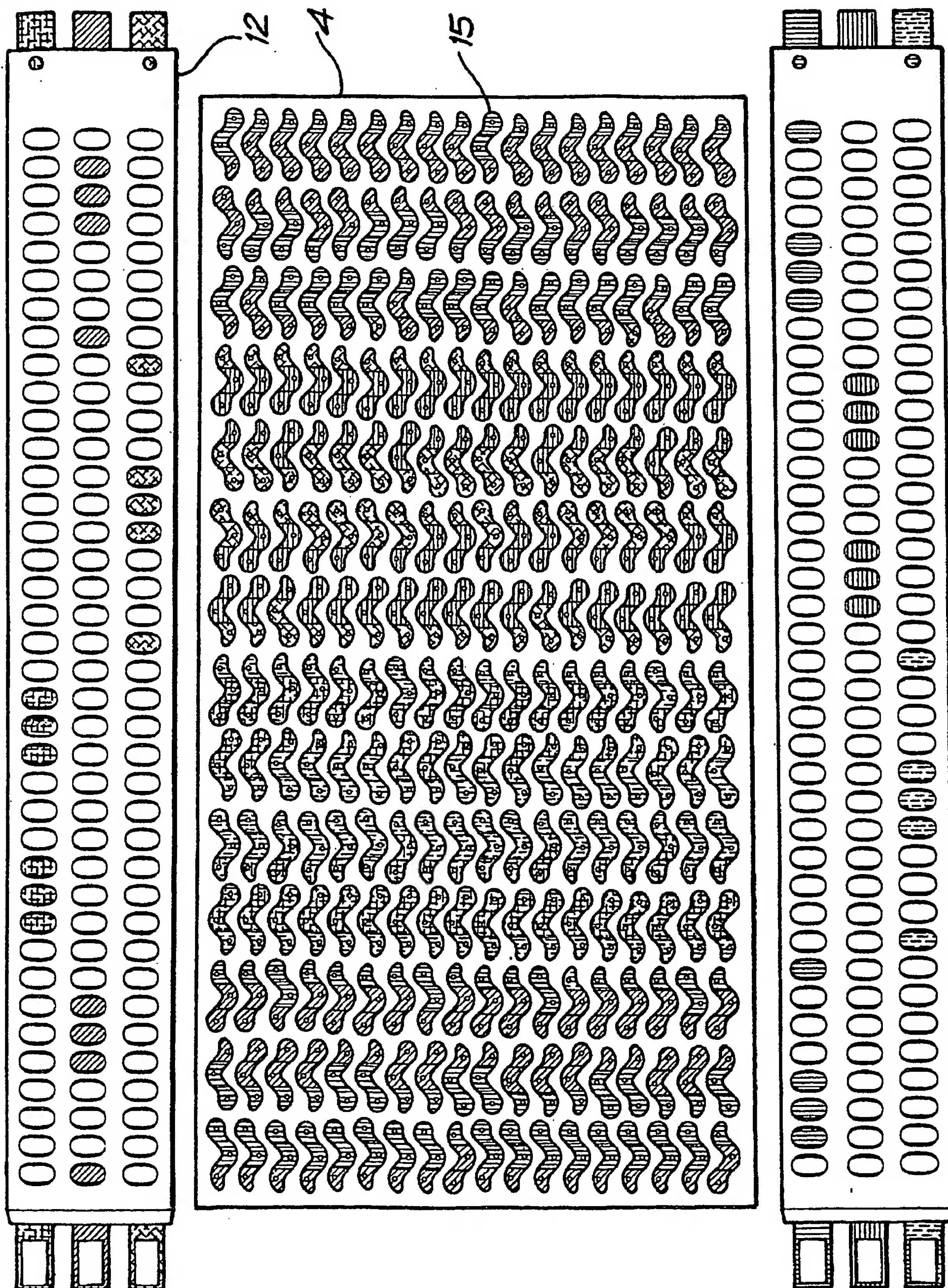


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2004/000058

A. CLASSIFICATION OF SUBJECT MATTER Int. Cl. ⁷ : A23G 3/12, A23P 1/10 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) A23G 3/-, A23G 7/-, A23P 1/- Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) WPIDS: confectionary, candy, mould, mold, colour, color, multicolor, multicolor, liquid, fluid		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 019 404 A (Meisner) 28 May 1991 whole of document	
A	US 6 383 539 B1 (Akutagawa) 7 May 2000 whole of document	
A	EP 1 103 187 A1 (Akutagawa Confectionary Co) 30 May 2001 whole of document	
A	US 4 184 613 A (Kinney) 22 January 1980 whole of document	
<input type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 11 March 2004		Date of mailing of the international search report 18 MAR 2004
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929		Authorized officer GARETH COOK Telephone No : (02) 6283 2541

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/AU2004/000058

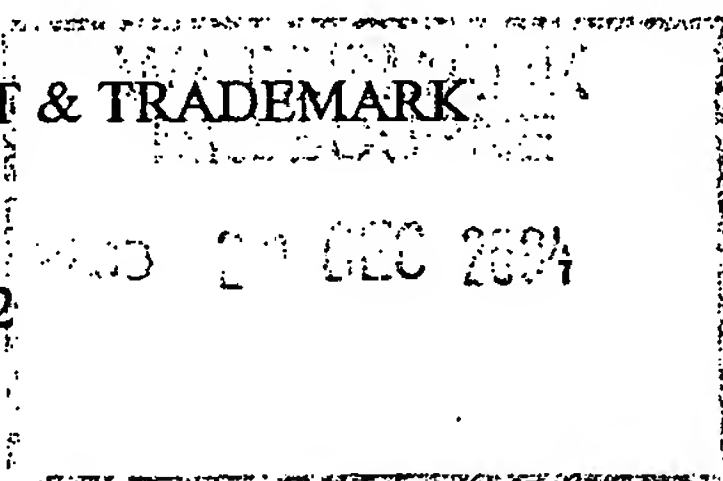
This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Patent Family Member			
US	5 019 404	JP	63116646	US	4 925 380		
US	6 383 539	AU	74537/98	EP	968 656	KR	2000035784
		CA	2 262 602	JP	10327756	WO	1998053699
EP	1 103 187	AU	50668/99	JP	2000050803	WO	200007455
		CA	2 339 240	US	6 660 317		
US	4 184 613	CA	1 052 626	US	3 991 217		
		CA	1 115 129				
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NOTIFICATION OF TRANSMITTAL OF
INTERNATIONAL PRELIMINARY
REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Rule 71.1)

Date of mailing
(day/month/year) 21 DEC 2004

Applicant's or agent's file reference
P22273PCAU

IMPORTANT NOTIFICATION

International application No.
PCT/AU2004/000058

International filing date (day/month/year)
16 January 2004

Priority date (day/month/year)
17 January 2003

Applicant

MARS INCORPORATED et al

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary report on patentability and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translations to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the *PCT Applicant's Guide*.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed invention is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

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PATENT COOPERATION TREATY
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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P22273PCAU	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/AU2004/000058	International filing date (<i>day/month/year</i>) 16 January 2004	Priority date (<i>day/month/year</i>) 17 January 2003
International Patent Classification (IPC) or national classification and IPC Int. Cl. ⁷ A23G 3/12, A23P 1/10		
Applicant MARS INCORPORATED et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
 - a. ☐ (*sent to the applicant and to the International Bureau*) a total of sheets, as follows:

☐ sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
 - b. ☐ (*sent to the International Bureau only*) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or table related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

<input checked="" type="checkbox"/>	Box No. I	Basis of the report
<input type="checkbox"/>	Box No. II	Priority
<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
<input type="checkbox"/>	Box No. IV	Lack of unity of invention
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<input type="checkbox"/>	Box No. VI	Certain documents cited
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Date of submission of the demand 5 August 2004	Date of completion of the report 16 December 2004
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer GARETH COOK Telephone No. (02) 6283 2541

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1 (b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):
- ☒ the international application as originally filed/furnished
- ☐ the description:
- | | |
|--------|--|
| pages | as originally filed/furnished |
| pages* | received by this Authority on with the letter of |
| pages* | received by this Authority on with the letter of |
- ☐ the claims:
- | | |
|--------|---|
| pages | as originally filed/furnished |
| pages* | as amended (together with any statement) under Article 19 |
| pages* | received by this Authority on with the letter of |
| pages* | received by this Authority on with the letter of |
- ☐ the drawings:
- | | |
|--------|--|
| pages | as originally filed/furnished |
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| pages* | received by this Authority on with the letter of |
- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to the sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to the sequence listing (*specify*):

* If item 4 applies, some or all of those sheets may be marked "superseded."

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 1-13	YES
	Claims	NO
Inventive step (IS)	Claims 1-13	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-13	YES
	Claims	NO

2. Citations and explanations (Rule 70.7)

The following documents identified in the International Search Report have been considered for the purposes of this report:

D1 US 5 019 404
D2 US 6 383 539
D3 EP 1 103 187
D4 US 4 184 613

Novelty (N) AND Inventive Step (IS) claims 1 to 13

None of the cited documents disclose all of the features of each of the independent claims. Therefore all of the claims are novel. The claimed invention is not obvious in the light of any of the cited documents nor is it disclosed in any obvious combination of them. It is also considered that it would not be obvious to a person skilled in the art in the light of common general knowledge either by itself or in combination with any of these documents.

Industrial Applicability (IA) claims 1 to 13

The claims are related to products capable of commercial application so are Industrially Applicable.

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